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**DSSD CENSUS 2000 PROCEDURES AND OPERATIONS MEMORANDUM SERIES B-15\***

MEMORANDUM FOR Howard Hogan  
Chief, Decennial Statistical Studies Division

From: Donna Kostanich *DK*  
Assistant Division Chief, Sampling and Estimation  
Decennial Statistical Studies Division

Prepared by: Richard A. Griffin *R. G.*  
Chief, Estimation Staff

Subject: Census 2000 - Service Based Enumeration Multiplicity Estimation

The attached document was prepared, per your request, to assist the Executive Steering Committee on A.C.E. Policy in assessing the data with and without statistical correction.

This report focuses on the Service Based Enumeration (SBE) Multiplicity Estimation. The analysis focused on the question of adjusting the count of persons enumerated during the single day visit to SBE facilities such as shelters and soup kitchens to account for persons who use these facilities but not on the day of the enumeration. Due to data quality concerns a decision has been made **NOT** to use multiplicity estimation to correct the count. This report documents the reasons for this decision.

# Census 2000: Service Based Enumeration Multiplicity Estimation

Richard A. Griffin  
U.S. Census Bureau

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## **Census 2000:**

# **Service Based Enumeration Multiplicity Estimation**

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prepared by Richard A. Griffin (portions contributed by Felipe Kohn and Annetta Clark Smith)

## **Executive Summary**

The Service Based Enumeration (SBE) is designed to provide people with no usual residence an opportunity to be enumerated. The Bureau planned special procedures to enumerate such persons at shelters, soup kitchens, mobile food vans, and certain outdoor locations with no apparent means of shelter. Because the SBE can only account for people at these facilities on the day of enumeration, the Bureau planned to apply multiplicity estimation to account for people who use these facilities but did not use them on the day of the SBE. The unadjusted census count for the non-Institutional Group Quarters population includes only those people actually enumerated (after unduplication) at these service locations on this one day. Due to data quality concerns a decision has been made not to correct the count of persons actually enumerated in SBE using multiplicity estimation. We have, however, simulated multiplicity estimation and can present results with appropriate limitations.

### **What is multiplicity estimation?**

Multiplicity estimation for SBE uses service usage responses to adjust enumeration counts for persons who use services but not on the day of enumeration. A person who only uses a service one night out of the seven nights in a week is given a weight of 7 since they only had one chance in 7 to be enumerated on the day selected for enumeration. Conversely, a person who uses a service all seven nights in a week is given a weight of 1 since they would be enumerated no matter what day was selected for enumeration.

### **Why have we decided not to use multiplicity estimation to correct the SBE counts?**

The usage responses have both a high nonresponse rate and, particularly in shelters, a very high level of response bias. Accurate responses to the usage question are critical for multiplicity estimation. For shelters 77 percent of the respondents to the usage question answered "1 night". We have independent evidence from other surveys that most users of shelters use them for more than 1 or 2 nights a week. In fact, the most frequent response should probably be "7 nights".

# Introduction

The uncorrected Census 2000 counts do not include any estimation derived from the use of sampling and estimation.

The Service Based Enumeration (SBE) is designed to provide people with no usual residence an opportunity to be enumerated. The Bureau planned special procedures to enumerate such persons at shelters, soup kitchens, mobile food vans, and certain outdoor locations with no apparent means of shelter. Because the SBE can only account for people at these facilities on the day of enumeration, the Bureau planned to apply multiplicity estimation to account for people who use these facilities but did not use them on the day of the SBE. The uncorrected census count for the non-Institutional Group Quarters population includes only those people actually enumerated (after unduplication) at these service locations on this one day.

During the SBE data collection operation, respondents were asked the number of times in a week that they use that type of facility (shelter or soup kitchen).

- In shelters, respondents were asked “Including tonight, how many nights during the past seven nights did you stay in a shelter?”
- In soup kitchens and mobile food vans, respondents were asked “Including today how many days during the past seven did you receive a meal from a soup kitchen or mobile food van?”

The responses to these questions can be from 1 to 7 or a nonresponse. The multiplicity estimator is based on the responses to these usage questions.

Corrected census data would have had different counts of total population using SBE facilities than the uncorrected data if we had joined results from the SBE multiplicity estimation with results from the actual Census 2000 SBE enumeration. Specifically, the corrected data would have used SBE Multiplicity Estimation to estimate the number of people who use services but not on the day of enumeration.

A decision has been made **NOT** to use SBE Multiplicity Estimation to estimate the number of people who use services but not on the day of enumeration.

The purpose of this report is to document the decision not to use multiplicity estimation and to provide information to support this decision.

The 1990 Census had a special operation, S-Night, designed to locate and enumerate persons without usual residence including those who use shelters, soup kitchens and other targeted service locations, but the data collection procedures were entirely different from those for the Census 2000 SBE and no estimation techniques were used. The Census Bureau felt it could

improve on the 1990 methodology and the Census 2000 SBE and multiplicity estimation procedures were devised. Because it is a new system, we do not have any estimation results from 1990 to compare to Census 2000 SBE multiplicity estimates.

An overview of SBE multiplicity estimation is available in the DSSD Census 2000 Procedures and Operations Memorandum Series Q-36.

## **Decision not to use Multiplicity Estimation**

Multiplicity estimation for SBE uses service usage responses to adjust enumeration counts for persons who use services but not on the day of enumeration. A person who only uses a service one night out of the seven nights in a week is given a weight of 7 since they only had one chance in 7 to be enumerated on the day selected for enumeration. Conversely, a person who uses a service all seven nights in a week is given a weight of 1 since they would be enumerated no matter what day was selected for enumeration. For nonrespondents to the usage questions, the responses required for multiplicity estimation are imputed. See the Appendix for the multiplicity formula.

We have evidence that the level of response bias to these usage questions is unacceptably high. In addition the nonresponse rates to the usage questions are higher than we normally accept for most surveys. Thus, we have decided not to correct the count of persons actually enumerated in SBE using the multiplicity estimate which relies on the responses to these usage questions. Due to the highly biased responses that we received in the shelters, we decided that the multiplicity estimator should not be applied to this population; thus, only those persons actually enumerated will be included in the redistricting file.

## **What do we know about usage patterns in SBE facilities?**

A review of existing literature on the usage of services targeted to people without conventional housing shows the average length of stay at facilities is more than just a one or two night stay. These findings were confirmed in two studies at the national level, and various studies at the state and local level. Results from the National Survey of Homeless Assistance Providers and Clients (NSHAPC) show, "Examining the living situations of homeless clients during the eight-day period including the day of the interview and the preceding seven days reveals the extreme transiency of many homeless people. During this time period many clients slept in a number of different places, which could include places not meant for human habitation; emergency shelters or transitional housing; or living arrangements such as a house, apartment, or room in which someone is allowed to stay on a temporary basis. The Figure 1 shows the proportion of homeless clients who lived in each of these venues during the eight-day period in question, and also the proportion who used the combinations of such places."

The NSHAPC results show that during the eight day period in question, 73 percent of the homeless clients slept in one or more varieties of shelters. Only 34 percent of people slept only in shelters, 28 percent slept in both shelters and temporary housing, five percent slept in both shelters and on the street, and six percent slept in three places (shelters, temporary housing, and on the streets) during the eight day period.

The other national findings described in the study, “Emergency Shelter and Services: Opening a Front Door to the Continuum of Care”, shows that across all shelters, the mean length of stays was 71 days and the median was 30 days. However, this varied greatly, from a few shelters with mean stays of less than 5 days to a handful reporting average stays over a year. The 24-hour shelters had the longest median stays, at 30 days; the small number of day-only shelters showed great variability in length of stay. However for 95 percent of these agencies, the average duration of residence per client was 9 months or less.”

## Summary Tables Relevant to the Decision

In this section, we present a summary of responses to the usage questions and the multiplicity estimation by facility type. Mobile Food Vans are included in the Soup Kitchen category.

Table 1 presents the percentage distribution of responses to the usage question by facility type. The nonresponse rate is also included.

Table 1: Distribution of Responses for Shelters and Soup Kitchens at the National level<sup>1</sup>

| Facility Type | Usage Question (nights or days in past seven) |    |     |    |     |     |     | Non-Response Rate |
|---------------|---|----|-----|----|-----|-----|-----|-------------------|
|               | 1   | 2  | 3   | 4  | 5   | 6   | 7   |                   |
| Shelters      | 77%   | 2% | 3%  | 2% | 2%  | 2%  | 12% | 28%               |
| Soup Kitchens | 36%   | 4% | 12% | 7% | 11% | 13% | 17% | 25%               |

<sup>1</sup>Not Including Puerto Rico

Table 2 presents the number of persons enumerated during SBE, the national level multiplicity estimate, and the ratio of the multiplicity estimate to the number of persons enumerated by type of facility.

Table 2: Ratio of Multiplicity Estimate to Persons Enumerated<sup>1</sup>

| Service Facility              | Persons Enumerated<br>(1) | Multiplicity Estimate<br>(2) | Ratio<br>(2)/(1) |
|-------------------------------|---------------------------|------------------------------|------------------|
| Shelters (includes BCFs)      | 183,414                   | 780,369                      | 4.25             |
| Soup Kitchens (includes BCFs) | 74,033                    | 165,365                      | 2.23             |
| TNSOLs                        | 23,080                    | 23,080                       | 1.00             |
| <b>Total</b>                  | <b>280,527</b>            | <b>968,814</b>               | <b>3.45</b>      |

<sup>1</sup>Not Including Puerto Rico

## Analysis and Recommendation

The main problem for the multiplicity estimation is the responses to the usage question in the shelters. For multiplicity estimation, the usage question responses are used for shelter respondents and soup kitchen respondents who did not use shelters in the last seven nights. About 71 percent of the persons enumerated in shelters and soup kitchens were enumerated in shelters (see table 2) and further, persons enumerated in soup kitchen that respond yes to the shelter usage question are not used in the estimation process. Thus usage responses in shelters are critical to the multiplicity estimate.

The multiplicity estimate is inversely proportional to the usage question response. Persons responding "1" get an effective weight of 7, while persons responding "7" get an effective weight of 1. Since 77 percent of the shelter persons responses (Table 1) to the usage question were "1", most of the persons enumerated in shelters had a effective weight of 7. We know from the surveys discussed above that most persons use shelters more than 1 or 2 days a week. In fact, the data suggest that the most frequent response ought to be "7", not "1". Using a preponderance of weights equal to 7 results in multiplicity estimates that are too high. Although we do not have independent data on soup kitchens for comparison, the responses to the soup kitchen usage questions appear more reasonable.

The ratio of the multiplicity estimate to the number of persons actually enumerated in shelters (4.92, from Table 2) is probably too high. The total national level multiplicity estimate of nearly 1 million persons is reasonably close to what was expected. However, using the multiplicity estimation results to distribute these persons to local areas and service facilities is not statistically defensible.



Other factors that contribute to the poor quality of the multiplicity estimator are:

- In the process of reviewing the data, we discovered that in every state, a considerable number of persons were enumerated with the wrong form; shelter persons with soup kitchen forms, soup kitchen persons with shelters forms and in both types of facilities a number of persons were enumerated with household forms (short and long). For multiplicity estimation we had to give all these persons a weight of 1, so they were effectively excluded from multiplicity estimation anyway.
- In New York City, four days before the scheduled SBE data collection, city employees collected administrative data in fifteen percent of the shelters, the largest shelters in the city. This was in lieu of collecting the data on enumeration day using the proper forms. Thus usage questions were not asked for these shelters. In order to be able to use the data, the records were transcribed to shelter forms with the understanding that the usage questions would be left blank. In the process of reviewing the data, we discovered that a large number of these forms did have answers to the usage question and in every instance the response was "1", which would result in a multiplicity weight of 7. For those shelters which we could identify as being enumerated using administrative records, all persons were given weight of 1, effectively removing them from multiplicity estimation. However, due to poor address information on the administrative list, not all these shelters could be identified on our data files.

Due to data quality concerns stated above, a decision has been made not to use multiplicity estimation to correct the count of persons enumerated during SBE.

## APPENDIX

### Multiplicity Estimation

The multiplicity estimator of persons without usual residence that use services has the formula shown below:

$$\hat{X} = \sum_{j=1}^n \frac{7}{A_j} + \sum_{j=1}^m \frac{7}{B_j} + X_{TNSOL} + X_{BCF}$$

n is the number of persons enumerated at shelters

m is the number of persons enumerated at soup kitchens or mobile food vans who said they did not use shelters in the last 7 nights

$A_j$  is number of nights in the last 7 nights person j used a shelter

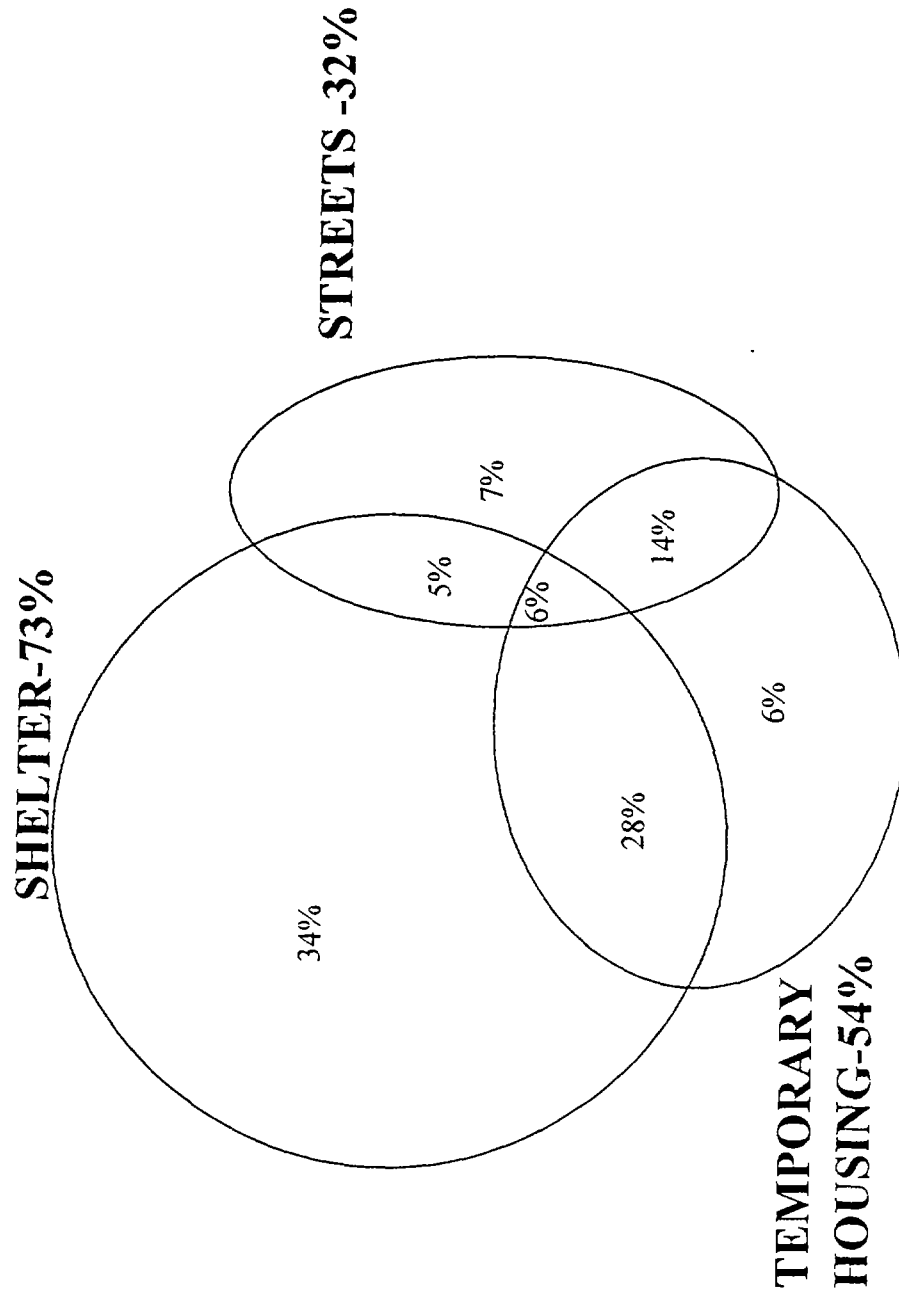
$B_j$  is the number of days in the last 7 days person j received a meal from a soup kitchen or mobile food van

$X_{TNSOL}$  is the number of persons enumerated at Targeted Non-Shelter Outdoor Locations (TNSOL)

$X_{BCF}$  is the number of persons without a usual residence enumerated on Be Counted Forms (BCF)

**Figure 1**

**Where Homeless Clients Slept on Day of Interview and Previous Seven Days**



Source: Urban Institute analysis of weighted 1996 NSHAPC client data. Client used option at least once during the eight days including the day of the interview and the seven previous days, including being sampled at the site. Shelter = emergency and transitional shelters and voucher programs, Streets = any place not meant for habitation, Temporary housing = own or other person's house, apartment, or room, including hotel/motel room that client paid for, but without the possibility of sleeping there for the next month without being asked to leave.